[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the binoculars which have a digital camera in one.
[0002]
[Description of the Prior Art]The binoculars with which the silver halide film type camera was attached, and what is called binoculars with a camera are known. According to these binoculars with a camera, the observation object under observation can be photoed easily and quickly. In these conventional binoculars with a camera, a beam splitter is allocated into one optical system of the observation optical system of a right-and-left couple, and the prism which the light flux further emitted from this beam splitter is entered, and is led to a film plane is arranged. That is, after the light flux which a part of light flux which passes along one observation optical system by the above-mentioned beam splitter was drawn out of this optical system, and was led to this exterior is reflected by the above-mentioned prism, it has structure led to a film plane.
[0003]The image connected on a film plane needs to be either an erect image or an inverted image. Since the image by the light flux drawn by the above-mentioned beam splitter out of the observation optical system turns into a flip horizontal (inside-out) image, it is used as either the erect image or the inverted image using the catoptric system of the above-mentioned prism etc.
[0004]Since the light volume which goes to the eyepiece side compared with the observation optical system of another side in an observation optical system while the beam splitter was provided decreases in the binoculars with a camera of the above-mentioned former, Light volume which installs an ND filter in the optical path of the observation optical system of another side, and goes to the eyepiece side in an observation optical system on either side is equalized.
[0005]Above, like, with the conventional binoculars with a camera, since it is necessary to provide one beam splitter, the catoptric system of at least one or more prism etc., and an ND filter, a device will be enlarged. Since it is necessary to provide mechanical elements, such as a film compartment, a cartridge chamber, a loop wheel machine style, and a shutter mechanism, in addition to these beam splitters, prism, and an ND filter, enlargement of a device is not avoided. In order to install a beam splitter and an ND filter in the optical path of an observation optical system, compared with the binoculars of the caliber, a view becomes dark and it was hard to observe.
[0006]
[Objects of the Invention]In this invention, it accomplished in view of the above problem. Therefore, structure aims at providing easy and small lightweight binoculars with a digital camera.

[0007]
[Summary of the Invention]In the binoculars with a digital camera with which this invention provided the digital camera in binoculars at one, The camera station which marched out in the optical path between an objective optical system, the observation optical system of the couple which has an eyepiece optical system respectively, the objective optical system in; one observation optical system, and an eyepiece optical system, When it is supported movable between the non-camera stations evacuated out of

this optical path and is in the above-mentioned camera station, The movable mirror which reflects the light flux which advanced into the above-mentioned optical path from the above-mentioned objective optical system out of this optical path; The time of un-taking a photograph makes the image sensor and the; above-mentioned movable mirror which receive directly the light flux reflected by this movable mirror out of the above-mentioned optical path stand by to the above-mentioned non-camera station, It is characterized by having a mirror driving means made to advance to the above-mentioned camera station, and; only at the time of photography.

[0008]That is, the binoculars with a digital camera which applied this invention draw a part of light flux which makes a movable mirror march out in the optical path of one observation optical system at the time of photography, and passes along the inside of this optical path out of this optical path, and have the composition which carries out image formation of this drawn light flux directly on the image sensor which is an electronic device. Since direct entering of the reflected light flux reflected by the above-mentioned movable mirror out of the above-mentioned optical path is carried out to an image sensor according to this composition, on an image sensor, image formation of the flip horizontal (inside-out) image is carried out. However, whenever it reads in order of predetermined read-out which wrote temporarily the image data of the image by which image formation was carried out on this image sensor in the image memory etc., and set up after that this image data written in temporarily beforehand, the picture as an erect image can be acquired. That is, no matter the direction of an image by which image formation is carried out for [an image sensor] installation and to the imaging surface of this image sensor may be direction [what], whenever it sets up beforehand a read-out order of the image data corresponding to the direction, the picture as an erect image can be acquired. Therefore, according to the composition of above-mentioned this invention, the flexibility of arrangement of an image sensor or each optical member is high, and does not need to establish the catoptric system of prism etc. between the above-mentioned movable mirror and an image sensor. Since a movable mirror is evacuated out of an optical path at the time of the observation through an observation optical system, i.e., un-taking a photograph, there is no necessity of providing an ND filter in the optical path of the observation optical system of the side which does not provide a movable mirror, and, therefore, a miniaturization and weight saving of a device can be attained.

[0009]

[Embodiment of the Invention]Based on a graphic display embodiment, this invention is explained below. Drawing 1 shows the embodiment of the binoculars with a digital camera which applied this invention. These binoculars 10 with a digital camera are the types which attached the digital camera to porro type binoculars. In the figure, only the important section concerning the observation optical system and this invention of the binoculars 10 with a digital camera is shown.

[0010]The left-hand side observation optical system which consists of the observation optical system 11L, i.e., the objective lens group, the porro 17L, and the eyepiece group 18L of the right-and-left couple which porro type binoculars with the common binoculars 10 with a digital camera have, It has a right-hand side observation optical system which consists of the objective lens group 11R, the porro 17R, and the eyepiece group 18R. Between the emission face of each porroes (erect optical system) 17L and 17R, and the eyepiece groups 18L and 18R of correspondence, the field diaphragms 19L and 19R are

being fixed.
[0011]Each set thing lens groups 11L and 11R are guided movable by one along with object optic-axis O_L of correspondence, and O_R at the cross direction.
Back and forth movement is carried out according to rotation of the focus ring (not shown) provided in the approximately center of binoculars 10 with a digital camera main part.
That is, if this focus ring is rotated suitably, the objective lens groups 11L and 11R will move forward and backward, and a focus will be performed.
[0012]The movable mirror 12 is formed in the binoculars 10 with a digital camera. That end part is being fixed to the rotation pivot 13 prolonged in the direction which this movable mirror 12 is located above optical-path P_R of one observation optical system, and abbreviated-intersects perpendicularly to each of object optic-axis O_L and O_R.
It is provided rotatable between the objective lens group 11R, the camera station (position shown as a solid line in drawing 1) which marched out in optical-path P_R between the porroes 17R, and the non-camera station (position shown with a dashed dotted line in drawing 1) evacuated out of this optical-path P_R.

[0013]The mirror drive motor 15 is being fixed between optical-path P_L of the binoculars 10 with a digital camera, and optical-path P_R.
The rotation pivot 13 is equipped as the axis of rotation of this drive motor 15.
Therefore, the movable mirror 12 is moved to the position of either a camera station or a non-camera station by rotation of the right reverse of the drive motor 15.
[0014]CCD image sensor 14 for picturizing the observation object image under observation as electric image data with these binoculars is formed in the binoculars 10 with a digital camera. This CCD image sensor 14 is being fixed to the position which is [predetermined length] separated from the movable mirror 12 in a camera station so that the light flux (observation object image) reflected out of optical-path P_R by the movable mirror 12 in a camera station may carry out image formation on that imaging surface (acceptance surface) 14a directly. The catoptric system of prism etc. is not established between the movable mirror 12 and CCD image sensor 14.
[0015]The angle of inclination to object optic-axis O_R in the camera station of the movable mirror 12 is set as 45 degrees so that the light flux reflected by the movable mirror 12 out of optical-path P_R may carry out image formation on the imaging surface 14a directly. The angle of inclination to object optic-axis O_R of this movable mirror 12 is not limited only to 45 degrees in this embodiment, but can be set as arbitrary angles.
[0016]Each image which consists of an arrow which has a white arrowhead, and an arrow which has a black-colored arrowhead shows the direction by each position of an observation object image until it results in CCD image sensor 14 among drawing 1. From direction of these each arrow, he can understand that image formation of the flip horizontal (inside-out) picture is carried out on the imaging surface 14a. The arrow D shown on the imaging surface 14a of CCD image sensor 14 shows the scanning starting point and the scanning direction among drawing 1. The scanning starting point of CCD image sensor 14 supports the position at the upper right of the observation object image of an erecting state so that the position of this arrow D may show.
[0017]The image recording circuit 20 containing CCD image sensor 14 is established in the binoculars 10 with a digital camera (refer to drawing 2). The image recording circuit

20 has CCD image sensor 14, the amplifier 21, A/D converter 22, the image memory 23, the image processing portion 24, and the main memory 25. The system control part 26 still more electrically [the image recording circuit 20] connected to each of CCD image sensor 14, A/D converter 22, the image memory 23, the image processing portion 24, and the main memory 25, It has the shutter release switch 27 electrically connected to this system control part 26. The mirror drive motor 15 is electrically connected to the system control part 26.

[0018]The shutter release switch 27 is interlocked with release ** (not shown) provided in binoculars 10 with a digital camera main part, and is opened and closed. The system control part 26 controls each of CCD image sensor 14, the amplifier 21, A/D converter 22, the image memory 23, the image processing portion 24, the main memory 25, and the mirror drive motor 15 according to the state of the shutter release switch 27.

[0019]If the depression of the release ** is carried out, the shutter release switch 27 will serve as one, and by one of this shutter release switch 27 the system control part 26, The mirror drive motor 15 is started, the movable mirror 12 is moved to a camera station from a non-camera station, immediately after this completion of a move, the CD image sensor 14 is driven and an image pick-up (exposure) is started. After this completion of an image pick-up, the system control part 26 starts the mirror drive motor 15 again, and evacuates the movable mirror 12 from a camera station to a non-camera station.

[0020]The analog picture signal acquired by the photoelectric conversion of CCD image sensor 14 is inputted into back A/D converter 22 amplified with the amplifier 21, and is changed into a digital image signal. Then, this changed digital image signal is once written in the image memory 23 which consists of RAM etc. The digital image signal written in the image memory 23 at this time is written in as image data of the mirror reversed image for one screen.

[0021]The image data based on the horizontal scanning of a mirror reversed image by which image formation is carried out to the imaging surface 14a of CCD image sensor 14 is recorded on the image memory 23 by 1 to 1 at the time of the writing of the digital image signal to this image memory 23. That is, a mirror reversed image is recorded also on the memory cell array 23a (drawing 3) of the image memory 23 by bit images.

[0022]Then, the image processing portion 24 writes the image data which read the image data written in this image memory 23, processed gamma correction, color correction, a data compression, etc., and performed this compression processing after that in the main memory 25. When reading the image data from the image memory 23, the image processing portion 24 writes in horizontally addressing of the memory cell array 23a of the image memory 23, and at the time, it is specifying by a right-and-left reverse order, and it reads it as a right-and-left reverse jam positive picture (noninverting picture) of a mirror reversed image. The picture read to the main memory 25 as this right picture is recorded on a predetermined address. The main memory 25 can consist of recording media, such as a flash memory, a magnetic disk, and a magneto-optical disc.

[0023]Drawing 3 shows signs that the picture information by the horizontal scanning of a mirror reversed image by which image formation is carried out to the imaging surface 14a of CCD image sensor 14 is recorded on the memory cell array 23a of the image memory 23 by 1 to 1 as bit images of a mirror reversed image. The left figure in drawing 3 shows the situation of the horizontal scanning in a **** case for the imaging surface 14a of CCD image sensor 14 from the back side.

The right figure in drawing 3 shows signs that the image data obtained by this horizontal scanning is recorded on the memory cell array 23a of the image memory 23 by 1 to 1. The memory cell array 23a consists of the number of record cells corresponding to the pixel number of CCD image sensor 14, i.e., the number of cells of i(total number of cells in direction of X) xj (the total number of cells in the direction of Y).

[0024]Drawing 4 and drawing 5 are flow charts which show the writing of the image data to the memory cell array 23a, and processing of read-out. Processing of this flow chart is started at the time of the write-in start of the image data to the memory cell array 23a. First, the writing position (X, Y) of the memory cell array 23a is set as (0, 0) (initialization), 1 is continuously added to Y, 1 is added to further X, and a memory writing position is specified (Step S1 - S4). Therefore, the writing position at the time of a memory write-in start (write-in starting point) is set as (1, 1).

[0025]If it judges whether X are i (X is the maximum) after step S4 and is not X=i, X is less than i (if it is X <i), processing of Step S3 and S4 will be performed again, and it progresses to Step S6 which will continue if it is X=i, and X is set to 0.).

[0026]It judges whether Y is j (Y is the maximum) after Step S6, if it is not Y=j (i.e., if Y is less than j (Y<j)), processing of Steps S2-S6 will be performed again, and it progresses to Step S8 which will continue if it is Y=j. All the specification of the writing position of the image data to the memory cell array 23a is performed by processing to the above steps S1-S7. That is, (2, 1) from a write-in starting point (1, 1), (3, 1), ..., (i, 1), (1, 2), (2, 2), (3, 2), ..., (i, 2), (1, 3), (2, 3), All the specification of the writing position of the image data to the memory cell array 23a is performed in order of ....., and (i, j). The image data outputted from A/D converter 22 is written in the memory cell array 23a one by one in order of specification of this writing position.

[0027]At Step S8, (X, Y) are set as (i+1, 0). Then, 1 is added to Y, 1 is subtracted from further X, and a memory reading position is specified (step S9-S11). Therefore, the reading position at the time of a memory read-out start (read-out starting point) is set as (i, 1). This read-out starting point supports the position at the upper left of the observation object image of an erecting state.

[0028]It judges whether X are 1 after Step S11, if it is not X= 1, processing of Step S10 and S11 will be performed again, and it progresses to Step S13 which will continue if it is X= 1, and X is set to i+1.

[0029]It judges whether Y is j (Y is the maximum) after that, if it is not Y=j (i.e., if Y is less than j (Y<j)), processing of step S9 - S13 will be performed again, and if it is Y=j, processing of this flow chart will be ended. .All the specification of the reading position of the image data to the memory cell array 23a is performed by processing to the above steps S8-S14. That is, (i-1, 1) from a read-out starting point (i, 1), (i-2, 1), ..., (1, 1), (i, 2), (i-1, 2), (i-2, 2), ..., (1, 2), (i, 3), (i-1, 3), All the specification of the reading position of the image data to the memory cell array 23a is performed in order of ....., and (1, j). The image data read from the memory cell array 23a turns into image data of the right picture which right and left have not reversed, and this image data is recorded on the after-operation main memories 25, such as compression processing, by this read-out order.

[0030](i-1, 1) from this starting point, (i-2, 1), ..., (1, 1), (i, 2), (i-1, 2), (i-2, 2), ..., (1, 2), (i, 3), (i-1, 3), in an above embodiment, set the read-out starting point of the memory cell array 23a as (i, 1), and, Although it had ..... and composition which specifies the reading position of the image data to the memory cell array 23a in order of (1, j), this invention is

not limited in order of this reading position specification. What is necessary is just to set up suitably the reading direction from the read-out starting point and this read-out starting point of the memory cell array 23a by the difference in the direction of an image by which image formation is carried out to for installation and the imaging surface 14a of CCD image sensor 14, so that the image data after read-out may turn into image data of an erect image.

[0031]For example, when the image by which image formation is carried out to the imaging surface 14a is an inverted image of a flip horizontal. (2, j) from this starting point, (3, j), ..., (i, j), (1, j-1), (2, j-1), (3, j-1), ..., (i, j-1), (1, j-2), set the read-out starting point of the memory cell array 23a to (1, j), and, If it has ..... and composition which specifies the reading position of the image data to the memory cell array 23a in order of (i, 1), the image data after read-out will turn into image data of an erect image.

[0032]As mentioned above, the binoculars 10 with a digital camera of this embodiment which applied this invention do not need any catoptric system of prism etc. between the movable mirror 12 and CCD image sensor 14. It is not necessary to provide an ND filter like the conventional binoculars with a camera. Therefore, a miniaturization and weight saving of the part and device main frame which do not need the catoptric system or ND filter of these prism are attained. Since an ND filter is not used, an observation visual field does not become dark.

[0033]In the above-mentioned embodiment, between observation optical systems on either side, with the mirror drive motor 15. By arranging the component parts (the amplifier 21, A/D converter 22, the image memory 23, the image processing portion 24, the main memory 25, stem control section 26 grade) of a digital camera section, the whole device can be constituted in flat shape and a miniaturization can be attained.

[0034]In the above-mentioned embodiment, since the movable mirror 12 was driven, the mirror drive motor 15 was used, but it may have composition which drives the movable mirror 12 using the electric-type driving means etc. which consist of a solenoid and a movable iron core.

[0035]This invention is applicable also to the monocle which attached the digital camera. This invention is applicable also to the binoculars which attached the silver halide film type camera. In this case, once reflecting the observation object light flux reflected by the movable mirror 12 in a camera station according to the catoptric system of prism etc., it becomes the structure which carries out image formation to a film plane.

[0036]

[Effect of the Invention]According to the binoculars with a digital camera which applied this invention above like. There is no necessity of establishing the catoptric system of prism etc. between a movable mirror and an image sensor, There is no necessity of providing an ND filter in the optical path of the observation optical system of the side which does not provide a movable mirror, Since there is no necessity of providing mechanical elements, such as a required film compartment, a cartridge chamber, a loop wheel machine style, and a shutter mechanism, when using a silver halide film, the miniaturization of a device, a weight saving, a cost cut, etc. can be aimed at. Since it is necessary to install neither a beam splitter nor an ND filter in the optical path of an observation optical system, problems, like compared with the binoculars of the caliber, a view becomes dark do not arise.

[0037]Since the picture as an erect image can be acquired whenever it sets up beforehand

a read-out order of the image data corresponding to the direction no matter the direction of an image by which image formation is carried out for [an image sensor] installation and to the imaging surface of this image sensor may be direction [what], the flexibility of arrangement of an image sensor or each optical member is high.

[Translation done.]